

Historical note:

Thomas Houston and the founding of clinical pathology at the Royal Victoria Hospital, Belfast.

M G Nelson

Accepted 29 April 1994

At the turn of the century there was an exciting expansion of knowledge and understanding of disease. William Osler commented “diseases familiar to our fathers and grandfathers have disappeared – the public health measures have lessened the sorrows and brightened the lives of millions”. It was the age of medical individualists, of men of outstanding ability, breadth of learning and great clinical skill. The doctor of this period was dependent upon his knowledge, his judgement, his five senses, few instruments and very few effective remedies. Help from a laboratory was only provided in teaching hospitals by University Departments of Pathology, which maintained autopsy and biopsy services and also performed some bacteriological examinations. As the clinical, as well as the academic commitments increased in these departments it became necessary to appoint assistants. In the year 1900, a Dr Thomas Houston was appointed Assistant Pathologist to Dr Lorraine Smith, then Lecturer in Pathology to the Queen’s College Belfast, and Pathologist to the Royal Victoria Hospital. On that day clinical pathology at the Royal was born, for it was largely due to the efforts and influence of this man that the hospital laboratories, as we know them today, came into being.

Thomas Houston was born in 1868 at Ballyclabber in the Route and he retained his rugged North Antrim characteristics all his life. A son and grandson of the Manse, he came, via Coleraine Inst, to the Queen’s College, Belfast, then a constituent college in the Royal University of Ireland, where he graduated with honours. After qualification, he was appointed to the Belfast Royal Hospital, first as house surgeon and house physician and then as assistant gynaecologist. He took his Doctorate of Medicine in 1899, which was the year that the hospital changed its name by charter to the Royal Victoria Hospital. The following year he embarked on his career as a laboratory worker.

The duties of the newly appointed assistant pathologist were clearly laid down to him as follows: That,

- i) He shall attend at the hospital at 10.30 am at least four days a week and at other times when required.

M G Nelson, MD, FRCP, FRCPI, FRCPath, DTM and H.
Formerly Consultant Clinical Pathologist to the Royal Victoria Hospital, and Honorary Professor of Haematology, The Queen’s University of Belfast.

- ii) He shall assist the pathologist in the examination of cases in the hospital at the request of the physicians and surgeons in charge.
- iii) He shall make arrangements by which he shall be in a position to furnish immediate reports on specimens submitted by the staff.
- iv) He shall be responsible for the preparation of microscopic specimens and for the efficiency of the hospital museum.
- v) He shall assist the pathologist in special investigations in the hospital which the pathologist may arrange to carry out.
- vi) He shall, in the absence of the pathologist, take charge of the department.

It can be appreciated from these conditions of service that the discipline of clinical or hospital pathology was, at that time, not highly regarded. Indeed, it was more than a quarter of a century before clinical pathologists received their due recognition as fellow members of equal standing with physicians and surgeons on the medical staff of hospitals.

The old Belfast Royal Hospital in Frederick Street, to which Dr. Houston was appointed, was then regarded as grossly out of date and inadequate and an entirely new hospital was being planned. This new Royal Victoria Hospital, of some 300 beds, was built on the Grosvenor Road site and officially opened in 1903 by King Edward VII. A communication addressed to medical students at that time stated "This Institution presents excellent opportunities for the study of medicine and, being the largest hospital for the reception of injuries and surgical diseases occurring in the large manufacturing city and seaport of Belfast, it affords unusual facilities for acquiring a knowledge of practical surgery". However, in this new hospital, facilities for clinical pathology were both poor and primitive, consisting of a few dingy rooms on the hospital premises and the grace and favour use of university laboratories.

Towards the end of the 19th century, two techniques had revolutionised the study of the blood. One was a method of counting blood cells and the other was a method of staining them, using aniline dyes. "Haematology at once threw off its colourless shackles", said Dameshek, "and delighted its devotees with dazzling colours". Many were attracted to a study of diseases of the blood by the beauty of these stained preparations, and the science of haematology was initiated. Dr Houston was then appointed in 1905 as haematologist to the Royal Victoria Hospital and as a member of the auxiliary staff. This, as far as can be ascertained, was the first appointment of a haematologist to a hospital in Great Britain or Ireland. In the following year the new appointee reported 43 cases of anaemia, two of haemophilia, three of splenic anaemia, two of pernicious anaemia and one of splenomegalic leukaemia.

Early in his career Dr Houston had fallen heavily under the influence of Dr Almroth Wright, the dominant force in bacteriology of his day. Both were Irish and sons of clergymen, both had been educated in Ulster and had met during family holidays in Ballycastle. Almroth was descended from the Wrights of Donnybrook, Co Dublin, and his father, Charles Wright, was a peripatetic intellectual, scholar, teacher and divine. His mother, Ebba Almroth (after whom he was named) was, like her husband a zealous Protestant, and was descended from a distinguished Swedish scientific family. After chaplaincy in a number of



Fig. 1 Sir Almroth Wright.

churches on the Continent, Charles Wright came, with his wife and family to Belfast and became Rector of St Mary's parish, where he remained for eleven years. His son, Almroth, 13 years old at the time, went to the Belfast Royal Academical Institution. He subsequently entered Trinity College Dublin in 1882, gaining his BA with first class honours (and Gold Medal), and qualified in Medicine the following year. After periods in Cambridge and Germany (where he worked under von Recklinghausen and others) he was appointed the Professor of Pathology at the Army Medical School in Netley. Here he began teaching the new science of bacteriology. For diagnosis and identification of bacteria, he used very simple apparatus in a system he described as "the technique of the teat and the capillary glass tube".

From diagnosis, Wright rapidly progressed to the treatment and prevention of bacterial infections and is probably best known for his work in the prevention of typhoid fever. In 1902 he left Netley for St Mary's Hospital, Paddington, where he established a world renowned laboratory which not only carried out diagnostic tests, but produced a great variety of vaccines and ran a busy vaccine therapy clinic, as well as carrying out an extensive research programme. Eager young men came to his department to work under the master. One of these was to discover penicillin and gain worldwide renown, and the laboratory at St Mary's was eventually renamed the Wright/Fleming Institute. Almroth Wright was knighted in 1906 and lived to a ripe old age, forceful and controversial to the end.

Physician in charge of haematology and vaccine therapy

Despite the limited facilities available to him, Dr Houston carried out an investigation, with Dr John Rankin, into an outbreak of cerebrospinal fever which occurred in Belfast in 1907. Using the opsonic index and the "the rubber teat and capillary glass tube" methods of Wright, they studied the meningococci causing the outbreak and published their findings in the *Lancet*.¹ Two years later, in association with Dr S T (later Sir Samuel) Irwin, another paper appeared in the *Lancet* on the successful treatment of a typhoid carrier by inoculation with typhoid vaccine.²

The King Edward Memorial Building

King Edward VII, who came to the throne in 1901 and who presided at the opening ceremony of the Royal Victoria Hospital on the Grosvenor Road in 1903, died in 1910. Towards the end of that year, Sir John Byers, visiting gynaecologist to the hospital, informed the Medical Staff "that he had been

present at a meeting of some of the leading men in the city to consider the most appropriate form which the proposed memorial to the late King Edward VII should take". It has been decided by the meeting that the most suitable memorial would be an extension of the Royal Victoria Hospital. The Board of Management had accepted the suggested scheme and had requested the staff to formulate their demands so that some definite proposal could be laid before a meeting of the citizens, to be summoned in September 1910.

It was understood by the Board and by the City Hall committee that the proposed building should afford proper accommodation for the electrical department of the hospital and should also include a department for vaccine therapy and haematology. The space requirements for the electrical department were put forward by Dr Rankin and for haematology and vaccine therapy by Dr Houston; the equipment required cost about £500. The total space requested for haematology and vaccine therapy was a little under 1,500 sq ft, of which a mere 312 sq ft was allocated for laboratory purposes, the remainder being given over to vaccine therapy including 800 sq ft of waiting space for patients. At the meeting of staff when this was approved it was also recommended that "The Visiting Staff be increased by the addition of a Physician in Charge of the Department of Vaccine Therapy and Haematology, and a Physician in Charge of the Electrical Department". This promoted Drs Houston and Rankin to what would now be called consultant status.



Fig. 2 Dr T Houston at the laboratory bench.

Concern was soon expressed at a Medical Staff meeting in 1913 at the lack of facilities for clinical pathology in general within the hospital. Two proposals were made, one to recommend the establishment of facilities in the clinical classrooms of the medical wards, consisting of "a laboratory bench with equipment as specified – the cost not to exceed £105". The other suggestion was to create a post of a "full time officer to carry out the clinical pathological work under the direction of Professor Symmers (Professor of Pathology) and Dr Houston". The first of these proposals was acted upon, the second was frustrated by the outbreak of World War I in 1914.

The report of the activities of the haematology and vaccine therapy department for 1914 contained the following statement: "During the year, 290 new cases were received and 3,320 treatments given and considering the disadvantages under which the work has hitherto been done for want of room, these figures are most encouraging. The work requires an enormous amount of laboratory investigation but up to the present it has been seriously hampered for want of proper accommodation. This defect will, however, be remedied in the near future by the opening of the new King Edward VII Memorial Wing in which a suite of rooms will be devoted to the work of this department". The building was completed and officially opened in 1915. There was space for a new laboratory but this could not be used as the staff who were expected to work in the laboratory were serving in the war in France. As an interim measure Dr Rankin was appointed to be responsible for the laboratory and vaccine therapy clinic during the war years, and the planned clinical pathology services had to wait until the end of the war before they could really begin to operate.

Dr Houston at war

Thomas Houston was one of many members of the staff of the Royal Victoria Hospital who offered their services during World War I. He was posted with Dr McCloy, a fellow Queen's graduate, and Mr Willix, a laboratory technician, to the laboratory of the St John Ambulance Brigade Hospital in Étapes, France, with the rank of major. Here he developed an interest in the enterococcus, which remained an abiding passion all his life. He published a paper with Dr McCloy on the relation of the enterococcus to trench fever.³ During his time at Étapes the laboratory was frequently visited by Sir Almroth Wright, from headquarters at Boulogne, which served to cement their lifelong friendship. In 1916 both hospital and laboratory were destroyed by aerial bombardment. After the raid the remaining laboratory equipment was salvaged and the whole operation moved to a safe area in Deauville on the Channel coast. During the war, Major Houston gained much practical experience in blood transfusions, which were to prove invaluable to him in peacetime and to the development of a transfusion service in Northern Ireland.

Post World War I

The year 1919 saw not only the end of the war but other important events in the Royal Victoria Hospital and its clinical pathology laboratory. Major Houston returned from France, having been twice mentioned in despatches, and awarded the OBE. It was not much of a laboratory to which the war hero returned, a suite of four empty rooms with one old autoclave. One of the very first things he did on his return was to persuade the medical staff to create a post

for Mr Willix, his faithful wartime technician, to join Mr McWatters, the only other technician in the laboratory. The next was to get some equipment. Fortunately the surviving laboratory equipment of the St John Hospital, Étaples, had been given to Major Houston by the St John Ambulance Brigade but he could not get it over to Belfast because sea transport was so busy. Through the usual grapevine, this difficulty reached the ears of one of the greatest friends and benefactors of the Royal – Lord Pirrie – who immediately despatched his private yacht to France and brought back most of the equipment. This was put into the King Edward Memorial Building and the laboratory duly opened. In its first year over 2,000 pathological examinations were carried out. The first resident clinical pathologist, Dr N C Graham, was appointed in the same year as assistant to Dr Houston, who retained the title of Physician in Charge of Haematology and Vaccine Therapy.

Dr Norman Clotworthy Graham

Dr Graham started his career as a bacteriologist in 1914, when he was appointed by the Medical Research Council to study the types of *M. tuberculosis* in Northern Ireland. Shortly afterwards, he enlisted in the Royal Army Medical Corps and during the war he was a Battalion Medical Officer in the famous Ulster Division in active service in the battlefields of Flanders. He was wounded in action, and was awarded the Military Cross. While convalescing at a base hospital he gravitated once again into laboratory work as a form of occupational therapy. The hospital Commanding Officer, a tempestuous Irishman from Cork, made repeated attempts to post Captain Graham into the Connaught Rangers

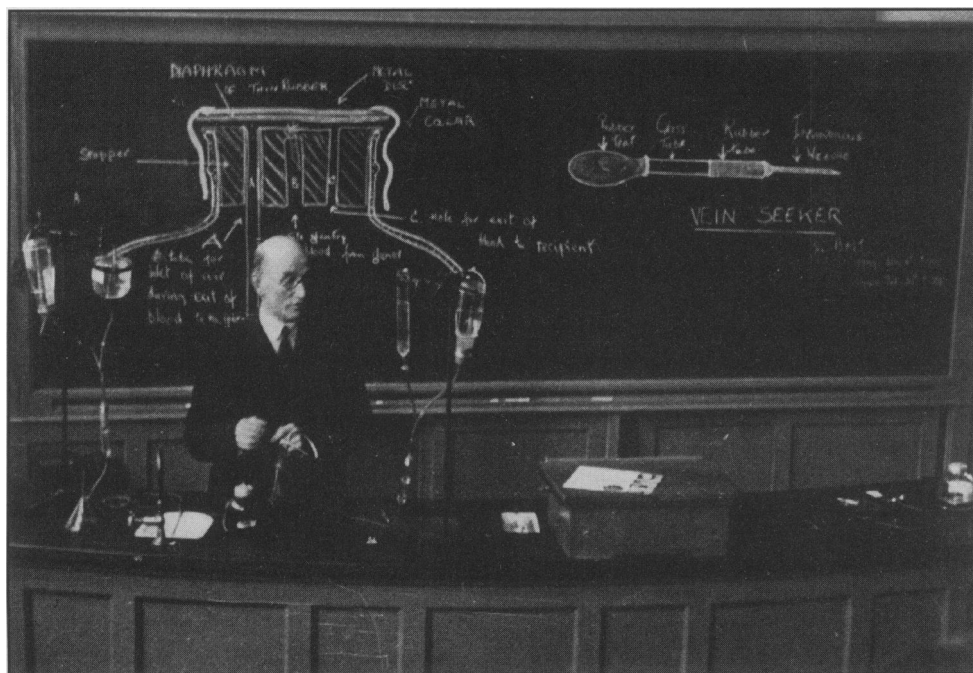


Fig. 3 Dr N C Graham demonstrating blood transfusion apparatus. (note the 'vein seeker' which is the main item illustrated).

but this was, for a time, resisted by his fellow medical workers. However, the higher command eventually plucked him out of the laboratory and dumped him into the Royal Flying Corps Medical Service, then very much in its infancy. Here he spent a considerable amount of his time visiting operational squadrons to deal with 'flying stress' among aircrews. It was during this period that he was involved in the postmortem examination on Baron von Richtofen, the great German flying ace, in order to decide whether he had been shot down from the air, as claimed by the Flying Corps, or by Army ground fire.

When Dr Graham returned to Northern Ireland after the war, he was appointed the first resident Clinical Pathologist at the Royal Victoria Hospital. However, he left this post after a short period to become Bacteriologist to the City of Belfast, and was subsequently appointed in 1926 as Lecturer in Bacteriology to The Queen's University of Belfast. He was affectionately known by generations of medical students as "Koch" or "the Hyphe". In the University department he acted as adviser to the hospital clinical pathological laboratories.

In 1919 there was a considerable extension of the serological division of the hospital laboratory. The government of the day was much concerned by the high venereal disease rate at the end of World War I and introduced a comprehensive venereal disease control programme. The Royal Victoria Hospital was considered a suitable centre and the laboratory at the Royal the place in which the investigations required for diagnosis could be carried out. During the first year over 3,000 Wassermann tests and over 300 other tests were carried out. These tests were paid for by local Government on a 'fee for service' basis and became an important and regular source of personal income for Dr Houston, whose post was that of an honorary, and therefore unpaid, member of the medical staff.

Clinical biochemistry

The fourth event in 1919 was the establishment, under Dr Houston, of a new section of the laboratory in an adjacent room in the King Edward Building to deal with biochemistry. This was one of the first hospital biochemical laboratories in the British Isles. Dr J A Smyth was appointed to take charge of this new development. Prior to the report by Folin and Wu in 1919 of a method to obtain a protein free filtrate of blood, biochemical tests had been limited. Following this discovery, clinical biochemistry blossomed, so that when Dr Smyth became Resident Biochemist to the Royal in 1922, and provided with new equipment and reagents, he was able to exploit a new, exciting and expanding area of medicine.

In 1923 the Medical and Surgical Staff reported "a biochemical laboratory has now been in existence for over a year. It is in full working order and during the past twelve months 1,400 examinations have been made. These have been mainly in the newer chemical methods of investigation, found so useful by physician and surgeon alike. A great factor in the volume of work coming to this laboratory has been the discovery of insulin by Banting and Best in the University of Toronto. This substance is the active principle of the Islets of Langerhans in the pancreas or sweetbread. It controls the utilisation of sugar in the system and is what is lacking in diabetic patients. The first use of insulin in human diabetes was in Toronto in 1922 but it was not until a year later that it

became available for use in the British Isles. It was possible to utilise it in this hospital at a very early date, owing to the ability of this laboratory to undertake blood sugar estimations and the other work necessary in connection with it. More than 60 patients have been treated with insulin and it has proved an invaluable addition to the treatment of diabetes. The whole outlook in this disease has been altered. From a steadily progressive and ultimately fatal disease, it may now be regarded as one which can be kept in check and, with proper care, need not shorten life. Without a biochemical department, the utilisation of insulin, this valuable remedy, would have been impossible. The Medical Staff take this opportunity of thanking the Board of Management for the generous and ready manner in which they voted the necessary funds for the purchase of insulin".

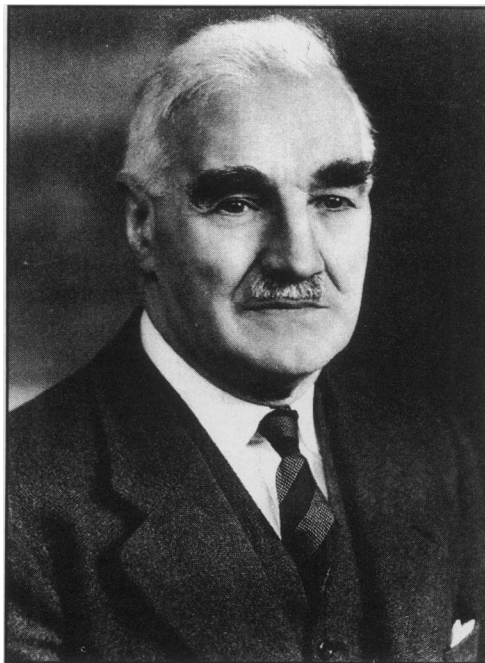


Fig. 4 Dr J A Smyth

The troubles

The early 1920's was the time of 'The Troubles' in Belfast and the Royal Victoria Hospital was in what was called in local parlance "a bad area". Frequent skirmishes between the security forces and the IRA took place in its environs. Dr Houston seemed quite oblivious of the dangers and would drive up the Grosvenor Road to his laboratory after dark with rifle fire criss-crossing the road. This was encapsulated in a couple of verses contained in the symposium in his honour on the conferring of his knighthood in 1927.

Nocturne 1921-22

The gunmen lurked round the Dunville Park
The lamps are out and the streets are dark
On the Grosvenor Road a corpse lay stark,
And the 'Specials' walked in dread.

But Tom, in the lab, ignored the thugs
And nightly tended his much loved bugs,
And coaxed the juice from the rabbits' lugs,
And calmly drove home to bed.

At the next staff meeting, Colonel Mitchell extended the good wishes of the staff to Sir Thomas Houston on the honour which had been bestowed on him. There is no record that Sir Thomas replied or thanked the staff, but he immediately referred to the milk supply of the hospital, as a sample of milk examined by the Public Health Authority had been found to contain "tubercle". A committee of

investigation was set up and a month later reported. It is interesting to note that the supplier was a Mr Morrison of Ballydrain, whose property was sold in 1958 to Malone Golf Club, so that the land on which the cattle grazed to supply the Royal Victoria Hospital with their milk has now become a golf course.

Despite his obsession with the enterococcus and with the therapeutic value of vaccine therapy, Sir Thomas maintained his interest in haematology. The report of the Pathological and Biochemical Laboratories and Vaccine Department for 1927 recorded "The Medical Research Council has entrusted to this laboratory, among others, the testing of the new liver extracts for the treatment of pernicious anaemia. These extracts are the final outcome of the work of Drs Minot and Murphy of Boston who, in 1926, reported the therapeutic value of liver in the diet of pernicious anaemia patients. After the clinical trials are completed the Medical Research Council will sanction the sale of these extracts. There is no doubt that this 'liver' diet has revolutionised the treatment of this disease. The extract will prove of great value to those patients who are unable to take whole liver". In the following year Sir Thomas was able to report among the 'blood affections', very satisfactory results in the treatment of pernicious anaemia by liver diet and liver extract.

Blood transfusion

During World War I, Dr Houston had gained considerable experience in blood transfusion technique. The service volunteer donors were rewarded with money, a bottle of port and a weekend pass. When he returned to Belfast after the war he found that recruitment of civilian donors was not so popular. In 1924 he reported "an increasing number of blood transfusions have been done by the laboratory staff during the year. It is thought advisable to have a permanent list of volunteer donors. An appeal was made to the public, through the press, and a good response was obtained. Laboratory staff have now a list of 74 tested donors who are willing to give their blood for transfusion in the case of an emergency". It is apparent that this waiting list was not adequate for the purpose, for in March 1927 the importance of blood transfusion, not only in medical cases but in surgical cases as well, was recorded and it was considered necessary to have a further list of persons willing to give their blood when required. "On several occasions the hospital had appealed to the healthy public of Belfast . . ." The response was said to be generous but not to be really sufficient to meet the requirements. "They had never any real difficulty in getting donors but they felt it was rather a hardship to call upon the same persons to give of their blood two or three times in the year. He wished to take the opportunity of thanking all those who had volunteered and especially members of the Royal Ulster Constabulary, who sometimes, in the middle of the night, had come to their assistance and given their blood". He thought it only required a little explanation to the healthy, male citizens of Belfast to secure a list of donors large enough to meet all requirements. It was the normal practice of this period for blood transfusions in the Royal Victoria Hospitals to be carried out by the staff of the clinical pathology laboratory. It was they, in times of emergency, who summoned the donors, either through Toc H or the Royal Ulster Constabulary, determined the blood groups, carried out the compatibility tests and transfused the blood into the recipients. It was not until World War II that resident medical officers and others were instructed in the technique of administration of blood.

The Institute of Pathology

In 1928, The Queen's University announced the intention of building and equipping Departments of Pathology and Bacteriology adjacent to the Royal Victoria Hospital. On receiving the news, the Medical Staff were quick to point out "the interdependence between the practical work of the hospitals and the scientific study of the phenomena and causes of ill-health". They "considered that such a step would be in the interests of the diagnosis and treatment of disease, the training of medical students and the advance of scientific knowledge". Consequently, the Medical Staff urged the Board of Management to facilitate the project by providing the university with the necessary site. The Institute was built in close proximity to the hospital, to which it was connected by an overhead bridge. It originally consisted of three floors of 3,600 sq ft each, the top floor of which housed the clinical pathology departments of bacteriology, biochemistry, haematology, and morbid anatomy or histopathology.

When the Institute of Pathology was formally opened in 1933, Sir Thomas Houston and Dr J A Smyth and their staffs vacated their cramped quarters in the King Edward Building and moved into what was to them, at that time, most generous accommodation. The year 1933 saw another significant event when Mr Albert Lamont joined the technical staff of the laboratory. He was plucked out of school by Sir Thomas, who informed the Medical Staff that he wished to have permission to appoint an additional laboratory apprentice as the new department would need extra assistance and that he had "got a suitable boy and wished to commence his training". This boy, therefore, commenced his training and became, eventually, the Chief Technician in Haematology, was awarded the MBE in 1983 and retired from 51 years of continuous service in one hospital in 1984.

In 1930 Dr Houston had been appointed Lecturer in Toxicology, a post which he retained for 26 years. Although not an inspiring lecturer, he retained the interest and respect of medical undergraduates. When Professor W W D Thomson was on sick leave, he was appointed by the Medical Faculty as temporary, acting, Professor of Medicine. A longstanding member of the Senate, he was in 1941 elected as a Pro Chancellor of the University, an appointment which he greatly cherished.

Sir Thomas reminded the Medical Staff in 1933 of his imminent retirement, which was due the following year. Various proposals were considered but not agreed by the time of the actual date. The temporary solution reached was to appoint Dr N C Graham "as Clinical Pathologist to the

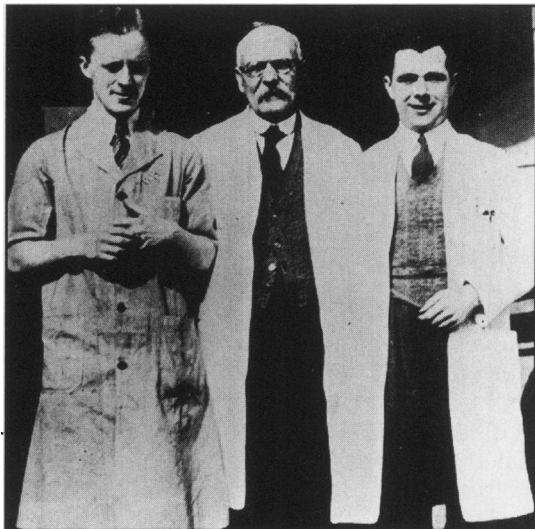


Fig. 5 The three original members of the technical staff. Mr A Lamont, Mr D Willix, Mr F Burns.

Hospital on a salary of £350 per annum", while he remained the Lecturer in Bacteriology to the University. At the same time, Sir Thomas was granted permission to continue to use the laboratory and to be responsible for the vaccine therapy clinic.

Although a bachelor, a workaholic and somewhat of a recluse, he had a wide circle of friends to whom he was known as 'Tommy'. He was a busy man, spending much time at the hospital and in his outpatient vaccine therapy clinic, but more especially in the laboratory, providing a service in bacteriology and haematology, as well as an almost one-man blood transfusion service. Meanwhile he carried out research and published papers in the medical literature. His hospital appointment was still honorary, and he was engaged in private consultant practice. He seems to have had few hobbies, but could be seen on warm summer afternoons, bedecked in whites, playing tennis on the courts behind the Royal. He died in June 1960, 50 years after he was first appointed as house surgeon to the Royal. The clinical pathology laboratory and the services they provide today are his best and most permanent memorial .

After his death a junior colleague paid the following tribute: "Above all his achievements shone the simple, kindly, human qualities which won for him the unique position which he held in the School. It is for these qualities that 'Tommy' Houston, humblest and most unassuming of men, will be affectionately remembered by the many generations of students who knew him".

Sir Thomas Houston should be especially remembered as the father figure of the clinical pathological services currently provided at the Royal Group of Hospitals. The National Health Service eventually provided the essential financial resources to expand and allowed the creation of three separate divisions, bacteriology, biochemistry and haematology, each with its own consultant clinical pathologist in charge, whilst the histopathological service continued to be provided by The Queen's University Professor of Pathology.

The rapidly rising workload, combined with a widening range of laboratory techniques, necessitated the replacement of the old rubber teat and capillary glass tube methods and the introduction of computer-linked automated laboratory equipment. This required greatly increased laboratory space in order to house the equipment and the staff needed to operate it. At the same time there was a gradual and much greater clinical involvement by the consultant clinical pathologists, especially in haematology. In order to deal with patients suffering from haematological disorders, a day clinic was established to provide diagnostic and therapeutic facilities. Concomitantly, the Northern Ireland Haemophilia Centre was created and beds were available in both the Royal Victoria Hospital for the treatment of adults and in the Royal Belfast Hospital for Sick Children for the treatment of children suffering from leukaemia.

The point had now been reached when the four separate clinical pathology services each had its own laboratory, staff and head of department – a far cry from the small, cold room in the old Royal where a limited service was provided on a part-time basis by the head of the University Department of Pathology. The separation of the hospital laboratory disciplines had finally taken place on the foundations laid down by Sir Thomas Houston.

ACKNOWLEDGEMENTS

The idea of writing a history of the clinical pathology laboratory at the Royal Victoria Hospital was suggested to me by the Hospital Archivist, Dr J S Logan. This offered an opportunity of recording the contribution made by Sir Thomas Houston in developing clinical pathology and the service it provided to the Royal Victoria and associated hospitals.

This historical record would not have been possible were it not for the enormous help offered by Mrs Henry, secretary to the Northern Ireland Leukaemia Research Fund in the Department of Haematology, and from Mr Roy Creighton who was responsible for reproducing most of the illustrations.

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